The current meter works automatically during a fortnight and may be left for that time unattended suspended from one of G. Ekman's submarine buoys.[4] By this mode of suspension, first suggested by the author, one avoids all the errors usually inherent in the ordinary measurements from an anchored ship and due to the proper motion of the latter. The Ekman buoy, by its double anchorage, is kept at a depth of say, 5 or 10 meters below the surface and there stands as firmly as a rock unaffected by the waves and currents of the surface.

A few of these current meters thus anchored in the Strait of Florida or off the coast of Formosa would serve to keep under observation and to record the amount of water carried northward; thus it would be possible to determine the possibility of using such information in making seasonal forecasts of the temperatures over the eastern United States and Europe, or over Japan.

Conclusion.

Notwithstanding the brilliant results gained through individual efforts like the cruises of Sir Frithiof Nansen or of Johan Hjort and Sir John Murray, the vast field of research offered by the ocean calls for international cooperation on a large scale, if the desired harvest of useful results shall be reaped. The following lines for this work appear to the author as particularly worthy of attention:

I. The existing international network of meteorological observations, suspended during the war, should be extended also over the oceans by means of regular observations from an adequate number of transoceanic liners, reporting by wireless. These telegrams also ought to include observations of the temperature and *the salinity of the surface water.*[5]

II. A special survey of the most important cold and warm currents and their regions of junction or conflict should be systematically maintained by cruisings of research steamers fully equipped for meteorological and hydrographical observations.

III. The internal movements, both horizontal and vertical in the stratified water near the coasts should be followed by regular observations from a sufficient number of fixed stations and lightships along the coast line. The results should be compared with those from simultaneous hydrobiological observations (prevalence of fish eggs, larvæ, and fish food or plankton) and the yield of the local fisheries, both as regards quantity and quality, and also with observations of the local weather, the occurrence of fogs, and, in cold climates, the freezing of fiords and bights.

If the oceanographers and meteorologists of the United States, of Canada, and of Japan were to unite their efforts with those of northwestern Europe in research along these or similar lines we should undoubtedly soon be on the high road to new and startling scientific discoveries and also to results of the greatest practical value.

ON WORKING UP PRECIPITATION OBSERVATIONS.

A number of the younger station officials, enthusiastic in the development and discussion of meteorological data and particularly that relating to the rainfall of the country, have proposed projects of study that seem to indicate a lack of familiarity with the more fully developed methods of analysis of observational data and processes for eliminating defects or errors due to changes in methods or in observers or other things that bring about discontinuity in a long series of observations. *In order to assist such students in the problem of discussing* our rainfall observations, we offer the following translation of selected passages in Dr. Hugo Meyer's "Guide to the working up of meteorological observations for the benefit of climatology."[1] Although the original is over 25 years old, the methods presented are still standard and the principles stated are still regarded as fundamental.—*Chief of Bureau.*

HOMOGENEITY OF THE OBSERVATIONAL MATERIAL.

In working up or discussing meteorological observations the very first care of the student must be to determine *the homogeneity of the series of observations he is* using, i. e., to make sure that the changes in values (both periodic and nonperiodic) arise solely from changes in weather, and that he has excluded all those sudden or gradual changes which may arise from a change in exposure, or in instruments, or in instrumental constants, or from a change in the observer—changes that at times may be of as great a magnitude as a change in location of the station. Therefore, if one is not perfectly certain that the tabulations he desires to discuss in further detail, actually do present the march of the meteorological elements he should undertake to test the homogeneity of the different factors of the series. * * *

Although it really seems to be a matter of course that one should convince oneself of the homogeneity of a series of observations before undertaking further discussion of them; and although Schouw emphasized the point as early as 1827, yet the full bearing of this circumstance has not been fully appreciated until Hann's recent investigations into this point.[3] Hann has also shown the most convenient way for applying tests of homogeneity.

The method for testing the observational material from a station is based on the experience that radical changes in weather are rarely confined to a limited region, rather they take place with the same sign and with more or less equal intensity over extensive districts. Hence *the differences* [in the case of pressure or temperature] *between simultaneous observations at neighboring points, are much more constant than the observed values themselves.*

Accordingly the testing of the observations at a station involves a comparison of the first with the simultaneous observations at a neighboring standard station whose work is of guaranteed accuracy; or if no such standard station is available then the comparison is to be made with simultaneous observations at not less than two neighboring stations.

The first method for comparing the observational results on a meteorological element at different localities which are not too far apart is *the graphic method.* The means for all the years (or months) under consideration are plotted on coordinate paper, using the same scale for each station and arranging the corresponding values at all stations for the same year in the same vertical line; each pair of points for the same locality are then connected by a straight line. In this way one secures a number of broken lines corresponding to the number of stations brought together for comparison. In each of these lines the rises and falls seem to succeed each other without order. On comparing all the curves it must appear, however, that the succession of rises and falls is the same

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[4] *Pettersson, H.* A recording current meter for deep-sea work. Quart. jour. Royal Meti. Soc., *London*, 1915.

[5] This suggestion by the author has been included in a proposal for the reorganization of the Swedish Meteorological Service, presented to the Government by the Swedish delegates to the International Council for the Exploration of the Sea.

[1] *Meyer, Hugo.* Anleitung zur Bearbeitung meteorologischer Beobachtungen für die Klimatologie. Berlin, Julius Springer, 1891. viii, [4], 187 p., 21½ cm. (Selections are from pp. 43–45, 51, 52, and pp. 132–140.)

[3] See in this connection *Julius Hann.* Untersuchungen über die Regenverhältnisse von Oesterreich-Ungarn. I. Theil: Die jährliche Periode der Niederschläge. Sitzungsber., Kaiserl. Akad. d. Wissensch., math.-naturw. Kl., Wien, 1879, 80-II, 571–635, particularly p. 573–578.